

# Homework Assignments

## Chapter 4: Functions

### Homework

- Section 4-1: pgs. 237-239: Graphs Relate Two Quantities: 1-10 all; 14, 15, 17-27 all
- Section 4-2: pgs. 243-245: Patterns and Linear Functions: 1-19 odds; 21-25 all
- Section 4-3: pgs. 250-251: Patterns and Non-Linear Functions: 1-21 odds; 23-26 all
- Section 4-4: pgs. 257-259: Graphing a Function Rule: 2, 4, 6-8, 21-23; 24, 28, 34-40 evens, 42-48 all, 54-56 all
- Section 4-5: Writing a Function Rule: pgs. 265-267: 2-32 evens; skip 22 & 30; 33-38 all
- Section 4-6: Formalizing Relations & Functions: pgs. 271-273: 1-7 all; 12-15 all; 16-24 evens; 26-29 all; 32-47 all
- Extra Credit (due day of test): Chapter Test: pg. 275: skip #13-16

### Chapter Notes / Terms

**Relation** – Any set of ordered pairs

**Function** – Any solution consisting of sets of ordered pairs (domain, range) such that no member of the domain is paired with more than one member of the range [i.e. (2,3) and (2,-3)]. Visually, the graph of functions will pass the “vertical line” test or "mapping test".

**Domain** - The set of all x-values in a relation (Input)

**Range** - The set of all y-values in a relation (Output)

**Mapping Test** - Visual representation of a relation, placing all the x-values one time in a left column and all the y-values one time in a right column, using arrows to indicate which x value is paired with each y value. It is used to determine if the relation is also a function. Any mapping that results in a "<" opening to the right indicates a relation that is **NOT** a function.

**Vertical Line Test** - Visual determination of whether a graphed set of ordered pairs, taken from a given relation, is also a function. If a vertical line can pass through more than one point **anywhere** on the graph, then the relation fails the vertical line test and is **NOT** a function.

**Function Notation** - Algebraic notation used to define a function. May appear in one of three forms:

- $y =$ 
  - Example:  $y = 3x + 5$
- $f(x) =$ 
  - Example:  $f(x) = 3x + 5$
- $g: x \rightarrow$ 
  - Example:  $g: x \rightarrow 3x + 5$

\* Note: All examples above would produce the same results.

Functions can be evaluated for various values of "x" [  $f(3) =$  ,  $g: 5 \rightarrow$  ]; have operations performed on them [  $f(2) + f(3)$ ,  $3 * g(x)$  ]; or be nested [  $f(g(4))$  ].

**Continuous Function** – function whose graph is not broken

**Discrete Function** – function whose graph consists of a set of disconnected points

**Linear Function** – a function whose graph forms a line or part of a line

**Function Rule** - An algebraic equation written in one of the three function notations that defines the relationship between the x-values and the y-values in the function.

### Homework Answers:

**Section 4-1: pgs. 237-239: Graphs Relate Two Quantities: 1-10 all; 14, 15, 17-27 all**

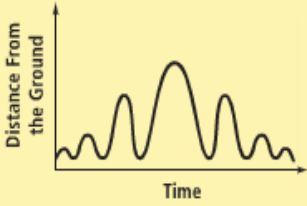
## Answers

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**Got It? (continued)**

2. C

3. a. Answers may vary. Sample:



b. The end of the graph would decrease sharply.

**Lesson Check**

1. Car weight, fuel used; the heavier the car, the more the fuel used.

2. The temperature rises slightly in the first 2 h and then falls over the next 4 h.

3. rising slowly: B; constant: C; falling quickly: D

4. Answers may vary. Sample: the depth of water in a stream bed over time

**Practice and Problem-Solving Exercises**

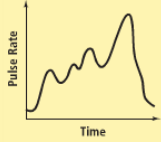
5. Number of pounds, total cost; as the number of pounds increases, the total cost goes up, at first quickly and then more slowly.

6. Time, grass height; the grass grows and you cut it, then it grows again and you cut it. This is repeated three times.

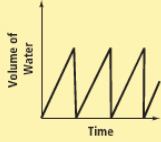
7. Area painted, paint in can; the more you paint, the less paint left in the can. You are using the paint at a constant rate.

8. C      9. A      10. B

13. Answers may vary. Sample:



14. Answers may vary. Sample:

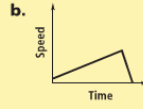
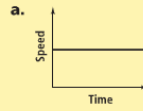


15. The graph shown represents the relationship between the number of shirts and the cost per shirt, not the total cost.

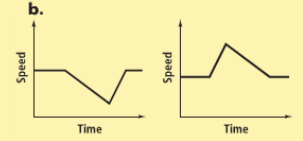


16. Check students' work.

17. No, they are not the same. Your speed on the ski lift is constant. Your speed going downhill is not.

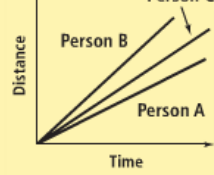


18. a. No, the graph is not reasonable. Your speed should decrease as you ride uphill.



19. The three runners start at the same time. At time A, one runner has a fast start, and the other two are a little slower. At B, the second-place runner catches up to the first-place runner and passes the first-place runner in order to win at time C. At C, the runner that was in third place catches up to the original first-place runner to finish second. At D, only the original first-place runner remains in the race.

20.



21. B

22. I

23. [2]  $\frac{9.35 - 8.50}{8.50} = 0.10$ , or a 10% increase. Another 10% increase would bring your hourly wage to  $1.1(9.35) = 10.285$ , or \$10.29. One further 10% increase would bring your rate to  $1.1(10.29) = 11.3135$ , or \$11.32.

[1] correct methods used with one minor computational error

24.  $\{-3, -1, 1, 3, 4, 5, 7, 9\}$

25.  $\{1\}$

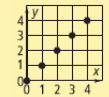
26.  $\{-1, 1, 3, 4, 5, 7, 9, 12\}$

27.  $\{1, 4\}$

## Section 4-2: pgs. 243-245: Patterns and Linear Functions: 1-19 odds; 21-25 all

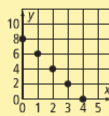
### Lesson Check

1. a.



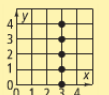
y increases by 1 for each increase of 1 for x.

b.



For each increase of 1 in x, y decreases by 2.

c.



x is 3 for any value of y.

2.

Number of Squares	1	2	3	4	10	30	$n$
Perimeter	4	6	8	10	22	62	$2n + 2$

3. independent: number of times you brush your teeth; dependent: amount of toothpaste

4. a and b are functions because for each input there is a unique output, but c is not a function because there is more than one output value for the input value 3.

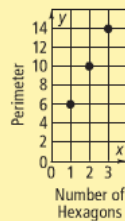
5. No; the graph is not a line.

6-10. See back of book.

7.

Number of Hexagons	1	2	3
Perimeter	6	10	14

Multiply the number of hexagons by 4 and add 2;  $y = 4x + 2$ .



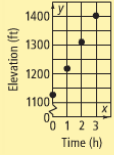
9. Start with  $-3$  and add 5 for each increase of 1 for  $x$ ;  $y = 5x - 3$ .



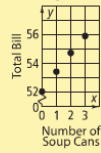
# Answers

## Practice and Problem-Solving Exercises (continued)

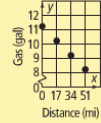
11. Yes; for each additional hour of climbing, you gain 92 ft of elevation;  $y = 92x + 1127$ .



12. Yes; each additional can of soup costs \$1.29.  $y = 1.29x + 52.07$ .



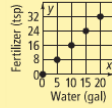
13. Yes; for every 17 mi traveled, the amount of gas in your tank goes down by 1 gallon;  $y = -\frac{1}{17}x + 11.2$ .



14. The number of defective loaves depends on the total number of loaves made. Therefore, the number of defective loaves is the dependent variable.

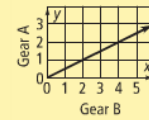
15.  $y = \frac{5}{8}x$ , where  $x$  is the number of gallons of water and  $y$  is the number of teaspoons of fertilizer. To calculate the powder needed to make a certain volume, use the equation  $x = \frac{5}{8}y$ .

x	y
0	0
5	8
10	16
15	24
20	32

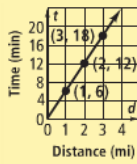


yes, because there is a unique  $y$  for each  $x$

17. Gear A will make one-half turn for 1 complete turn of Gear B;  $y = \frac{1}{2}x$ .



19.



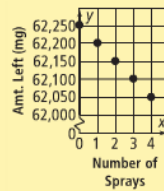
20. Yes, you can use either quantity as the independent variable. No matter which quantity you choose as the independent variable, there will be only one output for each input.

21. B

22. G

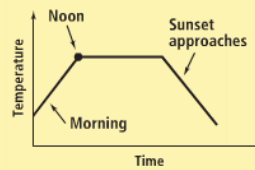
23. C

24. [2] For each spray, the amount left decreases by 50 mg;  $y = -50x + 62,250$ .



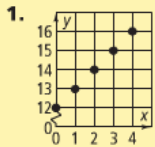
[1] correct methods used with one minor computational or graphing error

25.



## Section 4-3: pgs.250-251: Patterns and Non-Linear Functions: 1-21 odds; 23-26 all

### Lesson Check



linear

2.  $y = 3x - 2$       3. C

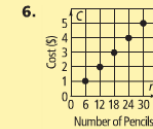
4. a. linear function

b. nonlinear function

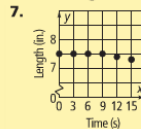
5. Only the first two pairs fit this rule. The rule that fits all the pairs is  $y = x^2 + 1$ .

### Answers

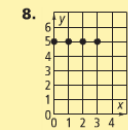
#### Practice and Problem-Solving Exercises



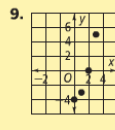
linear



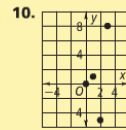
nonlinear



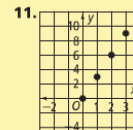
linear



nonlinear



nonlinear



linear

12. 48, (4, 48), 75, (5, 75); square the value of  $x$  and then multiply it by 3;  $y = 3x^2$ .

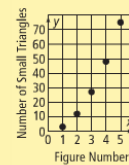


Figure Number

13.  $y = 4x^2$       14.  $y = (\frac{2}{3})^x$   
 15.  $y = 2x^3$       16.  $y = 0.5x^2$   
 17. Independent:  $r$ , dependent:  $V$ ; volume depends on the length of the radius.  
 18. Answers will vary. Sample:  $y = (-1)^x$

19. Let  $y$  = number of bags, and  $y = 6\pi r^2$ ; 3 bags; 4 bags; 5 bags

20.  $A = 4r^2 - \pi r^2$

21.  $y = x^2 + \frac{2}{19}$ ; the value of  $y$  is  $\frac{2}{19}$  more than the square of  $x$ .

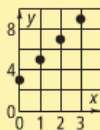
22. Nonlinear; if the function were linear, then there would be a value of  $x$  for which the value of  $y$  was less than 1.

23. B      24. G

25. [2]  $\$.89/15 \text{ oz} \approx \$.0593/\text{oz}$ ,  $\$1.69/29 \text{ oz} \approx \$.0583$ ; the 29-oz can has the lower cost per ounce.

[1] one computational error

26. The value of  $y$  is 3 more than twice  $x$ ;  $y = 2x + 3$ .

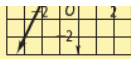


27. -24, -3, 14.5

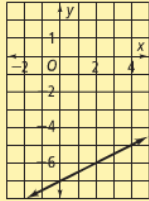
28. -11, 1, 11

29. -18, 0, -12.5

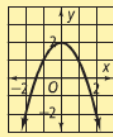
**Section 4-4: pgs. 257-259: Graphing a Function Rule: 2, 4, 6-8, 21-23; 24, 28, 34-40 evens, 42-48 all, 54-56 all**



2.



4.



5-8. See back of book.

**Practice and Problem-Solving Exercises**

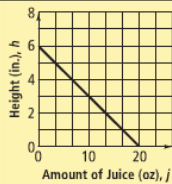
9-23. See back of book.

6. discrete

7. continuous

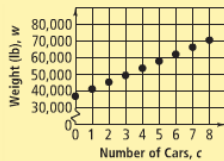
8. The graph should not be discrete; connect the points with a line so the graph is continuous.

21.



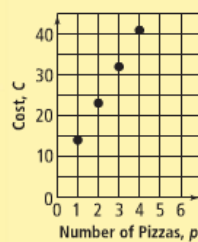
After you drink 20 oz of juice, the height is 0, so the interval  $0 \leq j \leq 20$  makes sense. The height goes from  $0 \leq h \leq 6$ ; continuous, because you can have juice in any amount.

22.



The truck can carry 8 cars, so the interval  $0 \leq t \leq 8$  makes sense. The maximum weight is 70,600 lb, so an interval of  $0 \leq w \leq 70,600$  makes sense. Discrete; the number of cars must be a whole number.

23.

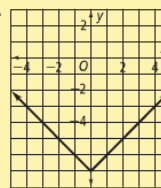


The number of pizzas can be any whole number except zero, so  $0 < p$ . 1 pizza costs \$14, so  $14 \leq C$ .

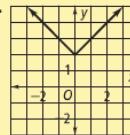
**Answers**

**Practice and Problem-Solving Exercises (continued)**

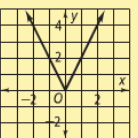
24.



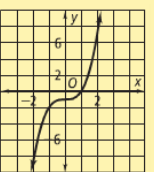
25.



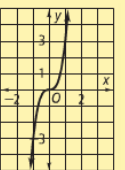
26.



27.

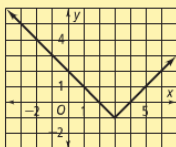


28.



258 Chapter 4

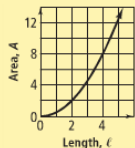
32.



33. No; the graph is continuous over the appropriate values of  $d$  and  $t$ .

34. No; when you substitute the values  $x = 2$  and  $y = 2\frac{1}{2}$  in  $y = \frac{1}{3}x = 2$ , you do not get a true statement.

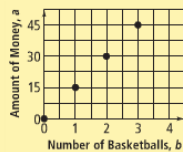
35.



Continuous; lengths and areas can be any number.

36. B  
37. a.

b	0	1	2	3
a	0	15	30	45



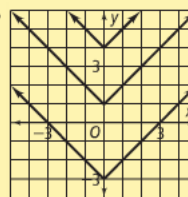
Discrete; you can only have whole numbers of basketballs.

b. 8

38. about 3 or 4 pickle chips

39. between 2 and 3 s

40.



The value of  $k$  tells how many units the graph of  $y = |x|$  has been shifted up or down on the  $y$ -axis.

42. \$287.50

43. 351

44. 17

45. 4

46. nonlinear

47. linear

48. -2, 12

49. -7, 1

50. 1, 13

51. -31, 9

52. no solution

53. -4, 4

54. -2, 4

55. no solution

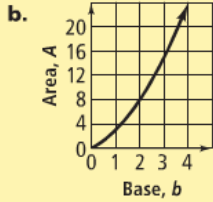
56. -3, 1

**Section 4-5: Writing a Function Rule: pgs. 265-267: 2-32 evens; skip 22 & 30; 33-38 all**

**Answers**

**Got It? (continued)**

3. a.  $A = b^2 + 2b$ ;  $288 \text{ in.}^2$



The graph is not a line.

**Lesson Check**

- $C = 3.57p$
- $f = \frac{h}{12}$
- $y = x + 2$
- $V = (d + 1)^3$
- dependent,  $a$ ; independent,  $b$
- You can't add holes and minutes. The correct rule is  $t = 15n$ .
- Continuous; side length and area can be any positive real numbers.

**Practice and Problem-Solving Exercises**

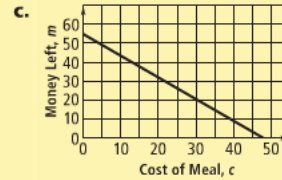
- $y = 4x - 5$
- $C = 8 + \frac{1}{2}n$
- $a = \frac{3}{5}b - 7$
- $\frac{h}{3} + 2.5 = w$
- $e = 8.75n$
- $p = 6.95 + 0.95t$
- $L = 42 + 4n$
- $a = 8 - \frac{1}{6}b$
- $h = 40 + 21t$ ; 985 ft
- $d = -10 - 50t$ ;  $-160$  ft
- $p = 72 + 12c$ ; 372 pages
- $A = \frac{3}{2}h + \frac{5}{2}h^2$ ;  $99 \text{ cm}^2$
- $V = \pi r^2(3 + 4r)$ ;  $138.16 \text{ in.}^3$ , or  $44\pi \text{ in.}^3$
- $A = 3w^2 - 2w$ ;  $8 \text{ ft}^2$
- Check students' work.

- $A = 1.6w^2$
- $d = -3.5 - 1.8s$ ;  $-435.5 \text{ m}$
- $h = \frac{10}{-64}j + 10$ ; 2.66 in.

27. a.

Cost of Meal	\$15	\$21	\$24	\$30
Money Left	\$37.75	\$30.85	\$27.40	\$20.50

b.  $m = 55 - 1.15c$

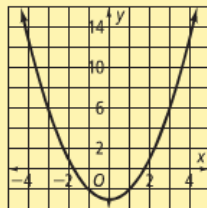


- a.  $b = 42.95d + 45.60$
- \$432.15

32.

x	-4	-3	-2	-1	0	1	2	3	4
y	15	8	3	0	-1	0	3	8	15

$y = x^2 - 3$



33. B      34. G      35. C

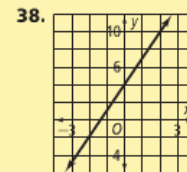
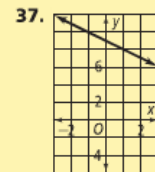
36. [4] a.  $D = 0.1m^2 + 5m$   
 $D = 0.1(60)^2 + 5(60)$   
 $= 0.1(3600) + 300$   
 $= 360 + 300$   
 $= 660$

The dosage is 660 mg.

b. First find out the equivalent weight of a 200-lb person in kilograms.

$\frac{1}{0.45} = \frac{200}{x}$  so  $x = 0.45(200) = 90 \text{ kg}$   
 Now substitute  $m = 90$  into the dosage formula.  $D = 0.1(90)^2 + 5(90) = 0.1(8100) + 450 = 810 + 450 = 1260$   
 The correct dosage for a 200-lb person is 1260 mg.

- [3] correct methods used with a minor computational error in either part (a) or (b)
- [2] correct use of dosage formula, but with an error in the conversion
- [1] correct answers with no work shown



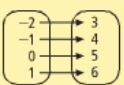
**Section 4-6: Formalizing Relations & Functions: pgs. 271-273: 1-7 all; 12-15 all; 16-24 evens; 26-29 all; 32-47 all**

**Answers**

**Got It? (continued)**

- 3. 1500 words
- 4.  $\{-8, 0, 8, 16\}$
- 5. a. domain:  $0 \leq q \leq 7$ , range:  $0 \leq A(q) \leq 700$   
b. The least amount of paint you can use is 0 quarts. The greatest amount you can use is 3 quarts.

**Lesson Check**

- 1. domain:  $\{-2, -1, 0, 1\}$ , range:  $\{3, 4, 5, 6\}$
- 
- function
- 2. yes
  - 3. 9
  - 4.  $\{-2, -1, 0, 1, 2\}$
  - 5.  $f(x) = 2x + 7$
  - 6. Answers may vary. Sample: Both methods can be used to determine whether there is more than one

output for any given input. A mapping diagram does not represent a function if any domain value is mapped to more than one range value. A graph does not represent a function if it fails the vertical line test.

- 7. No; there exists a vertical line that intersects the graph in more than one point, so the graph does not represent a function.

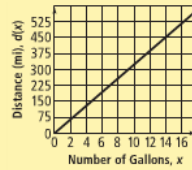
**Practice and Problem-Solving Exercises**

- 8. domain  $\{3\}$ , range  $\{-2, 1, 4, 7, 8\}$ ; no
- 9. domain  $\{1, 5, 6, 7\}$ , range  $\{-8, -7, 4, 5\}$ ; yes
- 10. domain  $\{0.04, 0.2, 1, 5\}$ , range  $\{0.2, 1, 5, 25\}$ ; yes
- 11. domain  $\{0, 1, 4\}$ , range  $\{-2, -1, 0, 1, 2\}$ ; no
- 12. not a function
- 13. not a function
- 14. function
- 15. function
- 16-17. See next page.

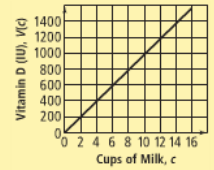
**Answers**

**Practice and Problem-Solving Exercises (continued)**

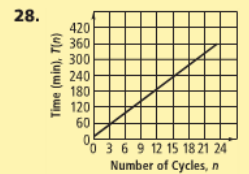
- 16. about 5,580,000 mi
- 17. \$11
- 18.  $\{-11, -9, -7, -5, -3\}$
- 19.  $\{-39, -7, 1, 5, 21\}$
- 20.  $\{0, 0.04, 1.44, 16\}$
- 21.  $\{-7, -2, -1, 3\}$
- 22.  $0 \leq x \leq 17, 0 \leq d(x) \leq 544$



23.  $0 \leq c \leq 16, 0 \leq D(c) \leq 1568$



- 24. not a function
- 25. function; domain:  $\{-4, -1, 0, 3\}$ , range:  $\{-4\}$
- 26. Check students' work.
- 27. 5; if  $f(a) = 26$ , then  $6a - 4 = 26$  and  $a = 5$ .

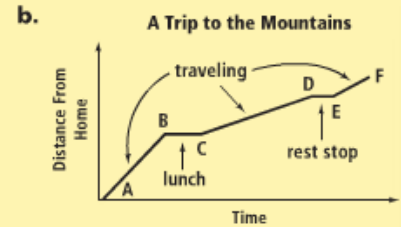


- 29. a.  $c$  is the independent variable and  $p$  is the dependent variable.
- b. Yes; for each value of  $c$ , there is a unique value of  $p$ .
- c.  $p = 5c - 34$
- d.  $0 \leq c \leq 40, 0 \leq p \leq 166$
- 30. Answers may vary. Sample given: any value except 1 and  $-7$
- 31. function
- 32. not a function
- 33. not a function
- 34. function

- 35. A horizontal line is a function because each value of  $x$  has a unique value of  $y$ ; a vertical line is not a function because the  $x$ -value has more than one  $y$ -value associated with it.
- 36. Answers may vary. Sample:  $\{(1, 3), (2, 3), (3, 3)\}$  is a function, but its inverse is not.

- 37. 23
- 38. 18
- 39. 6
- 40. 20
- 41. 5.25
- 42. 3
- 43. 11 stamps
- 44. 5 in.
- 45.  $E = 5h + 7$
- 46.  $a = 4.5s + 10$

- 47. a. time and distance



- 48. 9, 12, 15, 18
- 49. 8, 15, 22, 29
- 50. 0.4,  $-2.6, -5.6, -8.6$